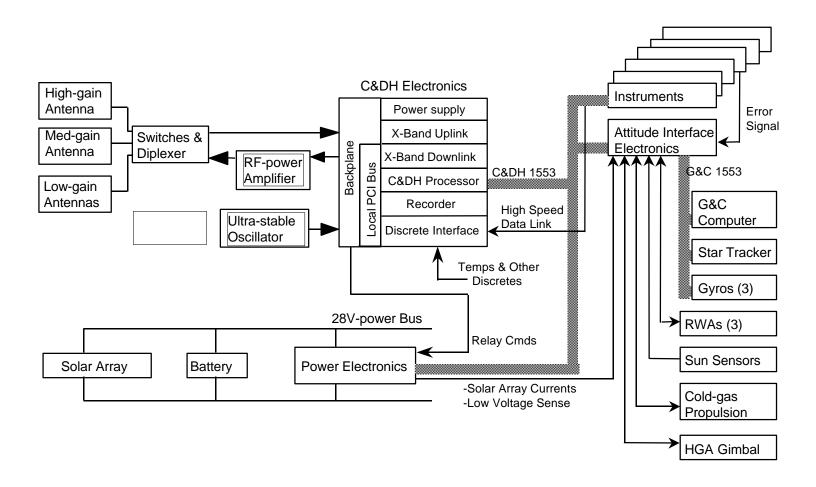
# STEREO Attitude Interface Electronics (AIE) & Attitude Flight Computer (AFC) Hardware Description

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#### Spacecraft Block Diagram



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#### **AIE Hardware Requirements**

- Provide the interface between the Guidance and Control System (G&C) and the Command & Data Handling System(C&DH)
- Provide the interface between the G&C system components
- Autonomously execute spacecraft attitude safing operations

#### **G&C Hardware System GYRO ATTITUDE INERTIAL STAR FLIGHT MEASMT TRACKER COMPUTER UNIT** (ST) (AFC) (IMU) C&DH 1553 BUS G&C 1553 BUS (Digital Solar Aspect Detector) DATA DSAD INTERFACE **ELECTRONICS CONTROL & SPEED TELLTALES** POINTING ERROR C&DH **SIGNAL** REACTION **ELECTRONICS SUN** WHEEL **INSTRUMENT SENSOR ASSY** (SCIP) (RWA) 2 3 (4) DISCRETE **ATTITUDE** CONTROL **INTERFACE CONTROL & TELLTALES ELECTRONICS** (AIE) **PROPULSION** MONITOR HIGH HIGH PRESSURE **PRESSURE** TRANSDUCER **THRUSTERS** LATCH **TEST PORT PROPULSION** VALVE **MONITOR** LOW PRESSURE TRANSDUCER SOLAR ARRAY CURRENT **POWER ANTENNA CONTROL & TELLTALES SUBSYSTEM GIMBAL** 28V BUS **DRIVE**

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#### **AIE Baseline Hardware Implementation**

- Single string modified TIMED implementation
  - Four printed circuit board assembly with motherboard:
    - > Processor Card: RTX2010RH @ 12MHz, 64Kwords RAM & EEPROM
    - > 1553 Card: Two MIL-STD-1553 bus ports (C&DH and G&C)
    - > Analog Interface Card: Accommodates subsystem analog interfaces
    - > Digital Card: Accommodates subsystem digital interfaces and relay control functions.
  - Relay Matrix: For IMU (gyro) control, propulsion system control, and antenna gimbal control
  - DC/DC Converter Board: 28V bus primary
- Processor and 1553 cards would be, for the most part, unchanged.
- Analog Interface and Digital cards should be considered as new designs to accommodate new G&C subsystems.

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#### **AFC Hardware Requirements & Implementation**

#### • Requirements:

- CPU: 32-bit architecture

Memory: (x)Mbytes SRAM, (y)Mbytes Flash EEPROM

- I/O: MIL-STD-1553 Bus

## • Implementation: Use same processor design as that for the C&DH processor

- Mongoose-V, @12Mhz, 2MByte SRAM, 4MByte EEPROM, 1MByte console boot ROM, 1553 bus, PCI bus(unused).
- May need to identify and incorporate alternative SRAM and EEPROM components (parts used on TIMED may no longer be available)
- Board layout modifications required to accommodate new and/or increased memory requirements.
- DC/DC Converter and Housing design unchanged from TIMED design.

### Mass, Power & Heritage

	<u>Mass</u>	<u>Power</u>	<u>Heritage</u>
<u>AIE</u>	4.5Kg	11W(@28V)	TIMED, but with some new design
<u>AFC</u>	2.5Kg	10W(@28V)	TIMED

#### **Candidate Trade Studies**

- AIE Processor Upgrade
  - Hardware upgrade costs versus software development cost
- Attitude Flight Computer: Make versus Buy
  - Significant processor upgrade to possibly eliminate the need for an AIE processor
  - Lowest combined hardware/software development cost option wins
- G&C Configuration Options:
  - Relocate AFC inside the C&DH Integrated Electronics Module (IEM) to save mass and power (single 1553 bus in AIE) and to eliminate the need to fabricate a separate housing.